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## PHOTODEGRADABLE SAMPLE COLLECTION SYSTEM AND METHOD

### GOVERNMENT SPONSORSHIP

This invention was made with government support under contract 2015-DN-BX-K042 awarded by the National Institute of Justice, Office of Justice Programs, U.S. Department of Justice. The government has certain rights in the invention.

### BACKGROUND

This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present disclosure, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present disclosure. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

The subject matter disclosed herein relates to collection of biological samples, and more specifically, to photodegradable systems and methods for collection of trace biological samples.

Extraction of trace biological samples (e.g., DNA) from a region of interest (e.g., crime scene) may involve capture and subsequent release of the biological sample for amplification and analysis. Capture of a trace biological sample may involve binding or absorption of the trace biological sample using a collection device. Examples of typical collection devices include cotton (e.g. cellulose fiber) swabs or pads that can be used to bind the biological sample and carry the sample to a lab for analysis. The biological sample may adhere to the cellulose fibers of the cotton swab or pad. However release of the biological sample from the cotton swab or pad may be cumbersome and may not result in complete yield of the trace biological sample collected.

### BRIEF DESCRIPTION

Certain embodiments commensurate in scope with the originally claimed subject matter are summarized below. These embodiments are not intended to limit the scope of the claimed subject matter, but rather these embodiments are intended only to provide a brief summary of possible embodiments. Indeed, the disclosure may encompass a variety of forms that may be similar to or different from the embodiments set forth below.

In one embodiment, a method includes providing a biological sample, providing a sample collection device, wherein the sample collection device includes a sample binding surface including a photodegradable polymer configured to bind the biological sample, contacting the biological sample with the sample binding surface of the sample collection device, and irradiating the sample binding surface and the bound biological sample using light emitted from a light source to initiate degradation of the photodegradable polymer of the sample binding surface to cause release of the biological sample.

In a second embodiment, a sample collection device includes a sample binding surface, wherein the sample binding surface includes a photodegradable polymer configured to bind a biological sample and configured to break-

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down into a plurality of polymer pieces, monomer pieces, oligomer pieces, or a combination thereof when exposed to a light.

In a third embodiment, a sample collection kit includes one or more sample collection devices, each including a sample binding surface, wherein the sample binding surface includes a photodegradable polymer configured to bind a biological sample and configured to breakdown into a plurality of polymer pieces, monomer pieces, oligomer pieces, or a combination thereof when exposed to a light, and a solution, wherein the plurality of polymer pieces, monomer pieces, oligomer pieces, or the combination thereof are soluble in the solution.

### BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, aspects, and advantages of the present disclosure will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

FIG. 1 is a schematic diagram of an embodiment of a method for capture and release of a biological sample using a photodegradable sample collection system, in accordance with aspects of the present disclosure;

FIG. 2 is a schematic diagram of an embodiment of a method for capture and release of a biological sample using a photodegradable polymer of a photodegradable sample collection system, in accordance with aspects of the present disclosure;

FIGS. 3A and 3B illustrate schematic diagrams of embodiments of the photodegradable polymer 42 and the results of irradiation cleavage of each embodiment of the photodegradable polymer 42, in accordance with aspects of the present disclosure;

FIG. 4 is a flow diagram of an embodiment of a method for capture and release of a biological sample using a photodegradable sample collection system, in accordance with aspects of the present disclosure;

FIG. 5 is a schematic diagram of an embodiment of a photodegradable sample collection kit, in accordance with aspects of the present disclosure;

FIG. 6 illustrates an example of a ultraviolet (UV) absorption spectrum of a photodegradable polymer 42, in accordance with aspects of the present disclosure

FIGS. 7A and 7B show cleavage of an electrospun photodegradable polymer upon irradiation, in accordance with aspects of the present disclosure;

FIG. 8 is a graph showing photodegradable polymer degradation after irradiation, in accordance with aspects of the present disclosure;

FIG. 9 is a graph showing polymerase chain reaction (PCR) performance of a biological sample following irradiation, in accordance with aspects of the present disclosure; and

FIGS. 10A-10E show examples of photodegradable polymers that may be used in a photodegradable sample collection device, in accordance with aspects of the present disclosure.

### DETAILED DESCRIPTION

One or more specific embodiments will be described below. In an effort to provide a concise description of these embodiments, all features of an actual implementation may not be described in the specification. It should be appreciated that in the development of any such actual implementation,